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series. In this paper he discusses the species commonly known as *Orthis testudinaria*, and concludes that several separate forms are generally comprised in it and that the original species has no typical American representative.

Professor Jules Marcou finishes his review of 'Rules and Misrules in Stratigraphic Classification.' Especial application is made to various members of the Orodovician, Mesozoic, Tertiary and Quaternary. In a postscriptum the three official geological maps of the State of New York are compared in some detail.

The extreme rapidity of weathering and stream erosion in the artic latitudes is described by Professor R. S. Tarr. The abundant lichen flora, the air and water and the great variations of temperature are the active agents.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES, FEBRUARY
1, 1897.

SECTION OF ASTRONOMY AND PHYSICS.

THE first paper was one postponed from last month by H. Jacoby, 'On two Trailplates of Circumpolar Stars, made by Anders Donner at the Helsingfors Observatory.'

It was explained that these photographic negatives of circumpolar stars were taken with the telescope stationary, and hence that each star left a trail upon the plate, which, after necessary corrections, would be an arc of a circle around the true north pole of the heavens. The exposure, which was for a few moments at intervals of a half hour, extending over 14 hours, thus gave a series of short arcs extending over a little more than a semicircle. This method, if no unforeseen difficulties appear, should give the position of the pole to within a few hundredths of a second of arc and a system of right ascensions differing from the truth by a uniform correction.

The paper was discussed by R. S. Woodward and others.

Mr. P. H. Dudley then presented a paper under the following title: 'Investigations of Undulations in railway tracks by his track indicator, and the reduction of two-thirds of the amount in the last fifteen years, by the use of his stiff-rail sections.'

Mr. Dudley pointed out the causes and character of the inequalities in railroad rails, and described his very perfect car for obtaining a complete record of the condition of the track while travelling at 20 to 25 miles per hour. Among other records given is the summation of the inequalities of the rail per mile. A dozen years ago this total unevenness amounted to six or seven feet even on the better roads; now as a result of the records of the car, and of new designs and methods of manufacture of rails, the total has been reduced to 18 to 20 inches. It was shown that this remnant was due to dents in the rails and could not be helped by work on the road bed, but must be reduced by further improvements in the manufacture of the rails.

Sections of rails and indicator records were exhibited, and lantern slides shown to illustrate the above improvements on the New York Central and Boston and Albany system. A great proportion of the gain is due to the improvement in Mr. Dudley's improved rail sections, which give a maximum of rigidity and wear, with a minimum of weight.

R. S. Woodward pointed out the extreme importance of many of the problems upon which Mr. Dudley is working, and hoped that the author's idea of a rail-rolling machine, which would turn out a 60-ft. rail *straight* and *cold*, would soon be put into operation. W. Hallock remarked upon the advantages to science which were sure to come from the author's investigation of many physical questions which cannot be studied in a laboratory and need a railroad to experiment with.

J. J. Stevenson called attention to what the community at large owes to Mr. Dudley's improvements. It means heavier engines, heavier cars, longer trains, greater speed, reduced freight and passenger rates, all of which greatly contribute to the general welfare and the advance of civilization.

H. S. Curtis presented a paper on 'The advantages of long-focus Lenses in Landscape Photography.' After referring to the unsatisfactory results of photographing landscapes with ordinary lenses, owing to false perspective and lack of detail, he showed how this was remedied by lenses of longer focus. A telescopic

combination of 40-inch focal length was used by reversing the lens and putting the flint and crown about 1 mm. apart. A number of views were shown to illustrate the advantages of such lenses.

Several pictures were taken with an ordinary spectacle lens, 34-inch focus, stopped to about $\frac{1}{2}$ -inch diameter, which were very good indeed and scarcely distinguishable from those taken with the telescopic lens or a telephotographic combination. Such a lens can be bought for ten cents.

J. F. Kemp spoke of the comparative uselessness of ordinary photographs in the study of mountain geology, and believed that such a simple camera would be of great value in field work. The paper was discussed by others.

WM. HALLOCK,
Secretary of Section.

NEW YORK ACADEMY OF SCIENCES—SECTION OF
GEOLOGY, FEBRUARY 15, 1897.

THE first paper of the evening was by Mr. F. C. Nicholas, and was entitled 'Explorations in the Gold Fields of Western Colombia.' Mr. Nicholas described the curious placers in western Colombia, which, while extremely rich in limited portions, are of very low grade when considered as extended propositions. The gold gravels occur along the western base of the Andes Mountains, and extend from the Gulf of Darien southward, up the Atrato River, to Quibdo. They are also found to the southward of the San Juan River and are in the form of terraces similar to the terraces of the Atlantic States. After the formation of the auriferous gravels the speaker supported the view that igneous intrusions and upheavals had cut them off from their parent hills in the interior and had recognized the drainage, so that the streams do not now head in auriferous rocks. The surface geology indicated that the Gulf of Darien formerly extended a long distance up the valley of the Atrato. Quite detailed descriptions of the gravels and of the character of the terraces were given in the paper. Mr. Nicholas described a route by which a man could sail in a canoe from the Atlantic to the Pacific in the wet season by going up the Atrato River to the Quito River, thence

to the divide, which is in a series of swamps, thence into the San Pablo River and on down the San Juan to the Pacific.

The second paper of the evening was by Professor R. E. Dodge, entitled 'Recent Work in Physiography.'

Professor Dodge gave an outline of De Laparent's 'Leçons en Geographie Physique,' of Sir John Lubbock's 'Scenery of Switzerland,' and of two recent papers, one by M. R. Campbell, entitled 'Drainage Modifications and their Interpretation,' and the other by C. F. Marbut, 'On the Physical Features of Missouri.'

The last paper of the evening was by A. A. Julien, on the 'Sculpture and Sorting of Sands.' The speaker, by means of lantern slides, illustrated various varieties of sand and their chief methods of origin and their composition. After citing the schemes for the classification of sands advanced by Zirkel and Daubrée he gave one of his own which was more elaborate and was partly based on the method of origin and partly on the physical characters.

J. F. KEMP,
Secretary.

AMERICAN CHEMICAL SOCIETY—NEW YORK
SECTION.

THE meeting was held at the College of the City of New York on Friday, February 5th, at 8:30 p. m., Dr. Wm. McMurtrie presiding, and about fifty members present.

The first hour was occupied with the 'Discussion of the Relations of the Section with the Scientific Alliance.'

Professor Breneman opened the discussion. Dr. Wiley described the work done by the Affiliated Societies of Washington, the advantages resulting from cooperation and more which might result from a little additional effort. He stated that, with possibly one exception, the Washington Societies were all strictly professional.

Professors Sabin, Doremus and others spoke strongly in favor of the Alliance; others thought the promised advantages had not materialized and that the returns were not proportionate to the annual subscription.

Dr. H. W. Wiley read a paper on the 'Value of Foods and the Methods of Ascertaining it,'

pointing out the disparity, at least until very recently, in the relative amounts of investigation and interest bestowed upon 'man foods' and animal foods. He described the classes of foods rated according to their fuel values, digestibility, etc., and noted the divergence between price and actual food value of many articles, some of them not luxuries.

The papers announced on 'Volumetric Estimation of Lead,' by J. H. Wainwright, and 'Electrolytic Production of Alkali Nitrites,' by Wm. M. Grosvenor, were held over until next meeting.

DURAND WOODMAN,
Secretary.

GEOLOGICAL SOCIETY OF WASHINGTON, 58TH
MEETING, JANUARY 9, 1897.

MR. WHITMAN CROSS read a paper on 'The igneous rocks of the Leucite Hills and Pilot Butte, Wyo.' in which he stated that the rocks of the Leucite Hills occur as surface flows and in volcanic necks or plugs. The leucite rock described by Zirkel, 20 years ago, is the least abundant type in the region, the other varieties containing more or less potash feldspar, as pointed out by Kemp in his recent communication to the Geological Society of America. Chemical analyses of various rock types were submitted, together with analyses of the pyroxene and mica.

The rock of Pilot Butte, an isolated point near the Leucite Hills, was also described and its chemical composition shown by an analysis. This rock is closely related to the leucite rocks, although containing much glass.

In a large cavity of the leucite rock was found a quantity of potash nitre, and on a protected face of the Boar's Tusk, a volcanic plug, was observed a white coating of soda nitre. The origin of these nitrates, whose mode of occurrence is so unusual, is not explained by any observations made.

This communication will soon be published in some scientific serial.

Mr. W. Lindgren read a paper on 'The Granitic Rocks of the Sierra Nevada,' in which he called attention to the large areas of intrusive granitic rocks occurring along the Pacific coast and to the fact that these intrusives are of com-

paratively recent date, probably early Cretaceous. A map of the distribution of the various kinds of granitic rocks in the northern part of the Sierra Nevada was exhibited. It was shown that, while some true granite exists, the largest mass is made up of grano-diorite, a rock intermediate between granite and diorite or, more accurately, intermediate between a quartz-mica-diorite and a quartz-monzonite, recently defined by Brögger.

W. F. MORSELL.
U. S. GEOLOGICAL SURVEY.

BOSTON SOCIETY OF NATURAL HISTORY.

A GENERAL meeting was held January 6th, eighty persons present.

Mr. A. W. Grabau read a paper on the sand-plains of Truro, Wellfleet and Eastham. (For an abstract see above p. 344.)

Professor N. S. Shaler, in commenting upon Mr. Grabau's paper, said that his observations agreed with those of Mr. Grabau as to the origin of the sand plains. The slopes are due to a complexity of causes and frequently cannot be discriminated. The hypothesis of fresh-water lakes and the ponding of streams was rejected as inadequate. Professor Shaler said that the agency of ants in the formation of these sand plains was very great, and should be considered in relation to any theory accounting for them.

Mr. J. B. Woodworth spoke of the difficulty of making out the internal structure of sand plains; he had observed that the gravels near the head were coarser than those from other parts. Mr. Woodworth compared the sand plains of the Cape region as described by Mr. Grabau with those he had studied in the Narragansett Bay district. The hypothesis of fresh-water lakes applies equally to the Narragansett Bay district. The kettle holes indicate masses of ice after the melting of the ice sheet.

Prof. W. M. Davis claimed that the slopes could be discriminated, but that they should not be solely relied upon.

Professor Shaler contended that the slope depended upon the material, and that the original angle is unreliable until the material is known. The difference of height of sea level should be

considered, and the origination of the deltas in the sea was advocated.

Mr. Grabau replied briefly to some of the points raised in the discussion and emphasized the differences between erosion slopes and construction slopes; the pointing of the slopes was stated; the material on the northern side of the sand plains was perhaps coarser.

Professor W. M. Davis defined briefly and with graphic illustrations coastal plains, and gave the outline for a geographic classification of the same. He advocated the use of distinctive descriptive names, and stated that the introduction of such terms as *doab* and *cuesta* would be of advantage to geographic science.

Professor Shaler claimed that many of the terms could be expressed by words in our own language, and that the introduction of words from foreign sources was to be deprecated.

SAMUEL HENSHAW,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis on the evening of February 1, 1897, Professor L. H. Pammel read a paper embodying ecological notes on some Colorado plants, observing that botanists who have studied the Rocky Mountain flora have frequently commented on the interest attached to the plants from an ecological standpoint, but most perplexing to the systematist. It is not strange that this should be the case, since there are great differences in altitude and soil, and the relative humidity of the air varies greatly. This is a most prominent factor in the development of plant life. A cursory glance at the plains flora of eastern Colorado shows that there are representatives of a flora common from Texas to British America and east to Indiana. We should not for a moment suppose that the species are identical in structure, since the conditions under which they occur are so different. Attention was called to the great abundance of plants disseminated by the wind, as *Cycloloma*, *Salsola*, *Solanum rostratum*, *Populus*, *Cercocarpus*, 'Fire-weeds' (*Epilobium spicatum* and *Arnica cordifolia*), *Hordeum jubatum*, *Elymus sitanion*, etc. Plant migration may be studied to better advantage in the irri-

gated districts of the West than elsewhere, partly because the water carries many seeds and fruits in a mechanical way, and partly because the soil is very favorable for the development of plants. Instances were cited where several foreign weeds are becoming abundant, as *Tragopogon porrifolius* and *Lactuca Scariola*. The latter, known as an introduced plant for more than a quarter of a century, is common at an altitude of 7,500 feet in Clear Creek Cañon. Once having become acclimated, it is easy to see how Prickly Lettuce is widely disseminated.

Collectors appreciate the great importance of giving more attention to conditions under which plants thrive, such as phases of development, soil, climate and altitudinal distribution. Structures of plants are produced to meet certain conditions. Under extreme conditions protective devices are more pronounced. In discussing some of the plants, Warming's classification into Hydrophytes, Xerophytes, Halophytes and Mesophytes was adopted. The Mesophytes of eastern Iowa were compared with some of the Xerophytes of western Iowa, such as *Yucca angustifolia*, *Mentzelia ornata*, *Liatris punctata*, etc. These increase in abundance in western Nebraska, and attain a maximum development in northern Colorado. In the foot-hills and mountains the Mesophytes constitute a large class, although the Xerophytes are common in dry, open, sunny places. The photosynthetic system is reduced to guard against excessive transpiration which would otherwise take place at high altitudes. The thick rootstock of alpine plants in dry open places is an admirable protection against drouth and cold. In cañons where snow remains on the ground plants do not need this protection. Halophytes are not numerous in species and genera. Hydrophytes are abundant at higher altitudes, where they occur in marshes and along streams.

At the meeting of the Academy of Science, of St. Louis, on the evening of February 15, 1897, Professor J. H. Kinealy presented a preliminary discussion of the Poley air-lift pump, a device for pumping water from artesian wells by injecting into the pump tube, at a considerable depth below the surface of the water, bubbles of air from an air compressor.

Mr. Trelease exhibited two hair balls removed from the stomach of a bull in Mexico, and showed that they were composed of the pointed barbed hairs of some species of prickly pear upon which the animal had unquestionably fed. Attention was called to similar balls from the stomachs of horses, which had been described in 1896 by Mr. Coville, of the United States Department of Agriculture.

WM. TRELEASE,
Recording Secretary.

THE TEXAS ACADEMY OF SCIENCE.

At the regular meeting of the Texas Academy of Science, held in the chemical lecture room of the University of Texas, at Austin, on Friday, February 5, 1897, Lieutenant W. V. Judson, U. S. A., presented a paper on 'The Improvement of Galveston Harbor.'

This important communication, by one of the engineers in charge, dealt with the following topics: (1) Introduction, The Problem in the Case. (2) Physical Characteristics, etc. (3) Early Operations. (4) Project of 1880 and Work there under. (5) Project of 1886. (6) Operations 1886-1891. (7) Continuous Contract System. (8) Contract with O'Conner, Laing and Smoot. (9) Dredging. (10) Physical Results.

In stating the problem, the speaker, after defining natural harbors, briefly discussed 'bars,' which he grouped into the following classes: (1) Drift Bars on seaward side of passes into areas embayed by sandy islands and peninsulas. (2) Drift Bars at the mouths of rivers emptying into non-tidal seas. (3) Drift Bars emptying into tidal seas. (4) Sediment Bars at the mouths of delta-building rivers. The Galveston Bars were assigned to class 1. The principles governing harbor improvements were next stated. Under Physical Characteristics, Galveston Bay was described as an area of water, consisting of 490 square miles, bounded by the main land of Texas, Bolivar Peninsula and Galveston Island. Two passes connect it with the Gulf of Mexico: (1) San Louis, with a cross-section of 20,000 square feet; (2) The Principal Pass between Galveston Island and Bolivar Point. Width of the gorge, 8,200 feet; depth, 0-50 feet. For purposes of deep draught

navigation the first is unimportant, consequently the improvements have been confined to the latter. To give an adequate idea of this work, it may be here stated that in 1867 there were 9½ feet of water on the inner bar of this pass and 11 feet on the outer. On January 1st, of the present year, there were 25 feet of water at low tide on both bars.

The first attempt to improve Galveston harbor began with the congressional appropriation of 1870. For ten or fifteen years thereafter work was intermittently carried on as Congress made appropriations. The present jetty system, which has opened Galveston as a deep-water port, was based on the 'Project of the Board of 1886,' which consisted of Generals J. C. Duane, Henry L. Abbot and Cyrus B. Comstock.

The following paragraph taken from Lieutenant Judson's paper will give the reader some conception of the magnitude of this, now virtually completed, undertaking: "To build the Galveston jetties there has been spent between July, 1887, and January 1, 1897, \$6,029,283.84. There has been incorporated in the jetties 88,355 cars of clay and rock aggregating 17,544.31 cubic yards of clay and 1,800,672.90 tons of granite and sandstone. To use a popular form of illustration, if loaded on cars, the material placed in the jetties since 1886 would form a train reaching from New York City to Cleveland, Ohio, and if this material were piled uniformly over an acre of ground it would be 1,050 feet above its base. I can recall no other single instance of work constructed by the hand of man that embodies within itself such a mass of material transported such a distance." The haul for the sandstone was 130-206 miles; for the granite 294 miles.

Mr. T. U. Taylor, professor of engineering in the University; Mr. Charles Corner, Engineer of the Texas Railroad Commission; President Winston and others took part in the interesting discussion that followed.

FREDERIC W. SIMONDS.

THE GEOLOGICAL CLUB OF THE UNIVERSITY OF MINNESOTA.

At the regular meeting on January 23d two topics were presented by Mr. Charles P. Berkey.

The first was an announcement of the oc-

cence of native copper and other copper minerals in the hematite ore of the Montana Mine, Soudan, Minnesota. The copper occurs in a thin seam and, in smaller amount, in cavities of the fractured ore. The original mineral of the group is native copper. This has been altered extensively to cuprite, malachite and, in more limited quantity, azurite. These minerals are found penetrating the ore for a distance of five or six feet below the seam and horizontally for a distance of eighty feet. None of the secondary minerals occur above the native copper. All the minerals are exceptionally pure. Some specimens of the copper show former crystals, the faces of which are now heavily coated with secondary products.

Attention was called to the very unusual association of these minerals. So far as the writer is aware, no similar occurrence has been recorded from the iron mines of the United States.

The second topic included several charts illustrating the glacial geology in the vicinity of Taylor's Falls, Minnesota. At this place the line of separation between the so-called eastern and western drift is very sharply defined. The course of the St. Croix river seems to be determined by the mutual adjustments of the eastern and western ice lobes. The moraine made up of typical eastern drift forms a close border along the east bank of the river for several miles, while typical modified western drift borders the west bank and, in at least one point, crosses the river. The combined effect is to force the river over the southwestern extension of the copper-bearing diabase of Keweenawan age exposed in this vicinity. It was further shown that the eastern drift occurs both below and above the western, arguing a readvance of the eastern lobe of ice upon the area of the receding western sheet. It was also shown that partially stratified early drift occupies a position so far below the average elevation of the sandstone surface in the present river gorge that it seems to indicate the location of a pre-glacial stream course at this place. Glacial action simply deepened this course and made it more permanent by directing through it a great glacial river. It was further pointed out that the original topography

of the country was such that any flow of ice from the north or northeast would concentrate exceptional eroding force in the gorge of the St. Croix in the vicinity of the present falls.

JANUARY 30TH, 1897.

At this meeting Mr. George W. Becker reviewed some of the points in the geology of northern Georgia. Facts derived from personal observation upon a recent visit to that locality were discussed at some length. These related chiefly to the methods employed in gold mining, to the value and extent of the asbestos deposits of Yhona Mountain, and the occurrence of corundum in northern Georgia.

CHARLES P. BERKEY,
Secretary.

NEW BOOKS.

Zeit- und Streitfragen der Biologie. OSCAR HERTWIG. Jena, Gustav Fischer. 1897. Heft II. Pp. iv+277.

Beiträge zur Kenntnis der Septalnectarien. J. SCHELWIND THIES. Jena, Gustav Fischer. 1897. Pp. 87 with 12 plates. 15 M.

Beiträge zur Lehre von der Fortpflanzung der Gewächse. M. MöBIUS. Jena, Gustav Fischer. 1897. Pp. viii+212. 4.50 M.

Kainogenesis als Ausdruck differenter phylogenetischer Energien. ERNST MEHNERT. Jena, Gustav Fischer. 1897. Pp. 165 with 3 plates.

Angewandte Elektrochemie. FRANZ PETERS. Vienna, A. Hartleben. 1897. Pp. 338. 3 M.

The Forcing Book. L. H. BAILEY. New York, The Macmillan Company. 1897. Pp. xiii+266. \$1.00.

Analysis of the Sensations. ERNST MACH, translated by C. M. WILLIAMS. Chicago, Open Court Publishing Company. 1897. Pp. viii+208. \$1.25.

Eclairage. J. LEFEVRE. Paris, Gauthier Villars et fils, Masson et cie. 1897. Pp. 180.

Les succédanés du chiffon en papeterie. Paris, Gauthier Villars et fils, Masson et cie. Pp. 173.

Glaciers of North America. I. C. RUSSELL. Boston, Ginn & Co. 1897. Pp. x+210.